NON-PUBLIC?: N
ACCESSION #: 9105060214
LICENSEE EVENT REPORT (LER)

FACILITY NAME: South Texas, Unit 2 PAGE: 1 OF 03

DOCKET NUMBER: 05000499

TITLE: Reactor Trip Caused by Actuation of a Generator Protective Relay
EVENT DATE: 03/30/91 LER #: 91-004-00 REPORT DATE: 04/29/91

OTHER FACILITIES INVOLVED: South Texas Unit 1 DOCKET NO: 05000498

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Charles Ayala - Supervising TELEPHONE: (512) 972-8628
Licensing Engineer

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On March 30, 1991, Unit 2 was operating at 100% while Unit 1 was in Mode 3. Unit 1 Control Room personnel closed the switchyard breaker to energize the Unit 1 Main and Auxiliary Transformers. Immediately following this breaker closure, the Unit 2 B Phase Generator Isophase Bus differential relay actuated. This caused the generator lockout relay to actuate which resulted in a turbine trip and reactor trip. The protective relay actuation was caused by differences in the saturation rates of the two current transformers that supply the differential relay. An evaluation is underway to establish the feasibility of hardware changes to address this problem. As an interim measure, a temporary modification has been installed that removes the protective function from the affected differential relay. Redundant protection is provided by other protective relays.

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END OF ABSTRACT

DESCRIPTION OF EVENT:

On March 30, 1991, Unit 2 was operating at 100% power, and Unit 1 was in Mode 3 at 2235 psi and 569 degrees during a refueling outage. The Unit 1 Control Room closed switchyard breaker Y510 to energize the Unit 1 Main Station and Auxiliary Transformers. Following closure of the Y510 breaker, the Unit 2 B phase Generator Isophase Bus differential relay (87-1/G1) actuated. This, in turn, actuated the Generator Lockout relay (86/G1) which caused a turbine trip and reactor trip. Feedwater isolation occurred on low Reactor Coolant System average temperature, and Auxiliary Feedwater (AFW) actuated on low-low steam generator level as expected. All other equipment functioned as expected.

The 87-1/G1 relay, which actuated during this event, received sensor inputs from a Current Transformer (CT) located in the neutral of the Main Generator and from a CT located on the Main Station Transformer (MST) side of the Generator Circuit Breaker (GCB). This relay, in turn, actuated the 86/G1 relay, tripping the Unit 2 Main Generator and Turbine.

Following the event, troubleshooting and fault recording analysis established that no actual fault occurred. Subsequent testing involving switchyard breaker manipulations at various generator load currents revealed that the current transformers associated with relay 87-1/G1 saturate at different rates, causing the relay to see a current differential across the generator when they are subject to transient currents (e.g., when closing certain switchyard breakers). The current transformers associated with relay 87-1/G1 are the only current transformers (in the generator protection circuitry) that exhibited this behavior.

This event, as well as a similar event on March 14, 1991, occurred after closure of breaker Y510 by the Unit 1 Control Room. Switchyard breakers Y510 and Y520 supply the Unit 1 Main Station Transformers (MST) and Unit Auxiliary Transformer (UAT) from the North and South 345 KV busses, respectively. Breaker Y520 contains pre-insertion resistors while breaker Y510 does not. The pre-insertion resistors provide for mitigation of current transients during switching operations. The magnitude of the current transient is controlled by inserting resistance into the circuit, via the pre-insertion resistor, slightly before closure of the main contacts on the circuit breaker. Absence of the pre-insertion resistor on breaker Y510 increased the magnitude of the

current transient during energization of the Unit 1 MST and UAT. If the 87-1/G1 relay current transformers had been matched relative to saturation rates, a relay actuation would not have occurred for the transient experienced.

CAUSE OF EVENT:

Actuation of relay 87-1/G1 and subsequent Main Generator Lockout was caused by a difference in the saturation rates of the CTs associated with relay 87-1/G1.

ANALYSIS OF EVENT:

Lockout of the Main Generator resulted in a Turbine trip and Reactor trip. Automatic actuation of an Engineered Safety Feature or the Reactor Protection System is reportable pursuant to 10CFR50.73(a)(2)(iv). This event did not result in any increased risk to the safe operation of the plant. All safety systems functioned as designed.

CORRECTIVE ACTIONS:

The following corrective actions have been taken as a result of this event:

1. Evaluation of test data collected for relay 87-1/G1 and the associated current transformers is continuing. The evaluation is expected to be completed by July 31, 1991. Corrective actions identified will be scheduled and prioritized at that time.

2. Temporary modifications have been implemented in both Units to remove the trip capability of the 87-1/G1 relays. Redundant protection is provided by other protective relays.

3. An evaluation will be completed by September 7, 1991, to determine methods to minimize current transients during switchyard circuit breaker switching operations.

ADDITIONAL INFORMATION:

On March 14, 1991, a similar Main Generator Lockout trip occurred, initiated from the B phase 87-1/G1 differential circuit (See LER 91-003). The extensive evaluation following the March 14 event established that no

electrical fault actually occurred. The analysis of the 87-1/G1 relay led to the conclusion that the relay was in a degraded condition, and as a result, actuated during the current transient resulting from the switchyard breaker closure. The unit was returned to service following replacement of the relay. It was not until the more extensive testing performed as a result of the second event that the cause of the relay actuation was established.

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The Light
company South Texas Project Electric Generating Station
Houston Lighting & Power P.O. Box 289 Wadsworth, Texas 77483

April 29, 1991
ST-HL-AE-3755
File No.: G26
10CFR50.73

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project Electric Generating Station
Unit 2
Docket No. STN 50-499
Licensee Event Report 91-004
Regarding a Reactor Trip Caused By
Actuation of Generator Protective Relay

Pursuant to 10CFR50.73, Houston Lighting & Power Company (HL&P) submits the attached Licensee Event Report (LER 91-004) regarding a reactor trip caused by actuation of a generator protective relay. This event did not have any adverse impact on the health and safety of the public.

If you should have any questions on this matter, please contact Mr. C. A. Ayala at (512) 972-8628 or me at (512) 972-7205.

William J. Jump
Manager,
Nuclear Licensing

SMH/amp

Attachment: LER 91-004 (South Texas, Unit 2)

LER\91107002.U2

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ATTACHMENT 1 TO 9105060214 PAGE 2 OF 2

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cc:

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Revised 01/29/91

L4/NRC/

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